

grating, the refractive index of the semiconductor substrate responsive to a temperature in the tunable Bragg grating of the semiconductor substrate.

12. (original) The apparatus of claim 8 wherein the tunable Bragg grating further comprises ~~/~~ electrodes disposed in the semiconductor substrate of the tunable Bragg grating to modulate a charge concentration in the semiconductor substrate, the refractive index of the semiconductor substrate responsive to the charge concentration in the tunable Bragg grating in the semiconductor substrate.

13. (original) The apparatus of claim 1 further comprising a multiplexer disposed in the semiconductor substrate, the multiplexer optically coupled to an output of the optical modulator so as to multiplex the optical beam generated from the gain medium with a plurality of other optical beams.

14. (original) The apparatus of claim 1 further comprising an optical splitter disposed in the semiconductor substrate, the optical splitter optically coupled to receive the optical beam, the optical splitter to split the optical beam into a plurality of optical beams.

15. (original) The apparatus of claim 14 wherein the tunable Bragg grating is a first tunable Bragg grating of a plurality of Bragg gratings disposed in the semiconductor substrate, each of the plurality of Bragg gratings optically coupled to the optical splitter to receive a respective one of the plurality of optical beams, each of the plurality of Bragg gratings to tune a respective output wavelength of the respective one of the plurality of optical beams.

merging the first and second optical paths to combine the first and second portions of the optical beam.

22. (original) The method of claim 19 wherein the optical beam is one of a plurality of optical beams that are generated, tuned and modulated in the semiconductor substrate, the method further comprising multiplexing the plurality of optical beams into a single wave division multiplexed (WDM) optical beam with a multiplexer disposed in the semiconductor substrate.

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23. (original) The method of claim 19 wherein tuning ~~the tuning~~ the output wavelength of the optical beam with the tunable Bragg grating disposed in the semiconductor substrate comprises adjusting a temperature of the semiconductor substrate including the tunable Bragg grating.

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24. (original) The method of claim 19 wherein tuning ~~the tuning~~ the output wavelength of the optical beam with the tunable Bragg grating disposed in the semiconductor substrate comprises adjusting a concentration of charge in the semiconductor substrate including the tunable Bragg grating.

25. (currently amended) An optical communications system, comprising:
an optical transmit module disposed in a semiconductor substrate, the optical transmit module including:
a gain medium disposed in the semiconductor substrate;

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of claim

29. (currently amended) The optical communications system¹ 25 wherein the optical modulator in the semiconductor substrate of the optical transmit module comprises:

a first optical path through the semiconductor substrate through which a first portion of the optical beam is directed;

a second optical path through the semiconductor substrate through which a second portion of the optical beam is directed;

first and second optical phase adjusting devices disposed in a semiconductor substrate in the first and second optical paths, respectively, the first and second optical phase adjusting devices to selectively adjust a phase difference between the first and second portions of the optical beam in response to phase adjustment signals by directing the optical beam through the semiconductor substrate and through charge modulated regions of the plurality of capacitors included in the optical modulator;

an optical confinement region disposed in the semiconductor substrate between the first and second optical paths so as to optically isolate the first optical path from the second optical path until the first and second optical paths are merged in the semiconductor substrate.

30. (original) The optical communications system of claim 25 wherein the tunable Bragg grating in the semiconductor substrate of the optical transmit module comprises a plurality of perturbations of a refractive index of the semiconductor substrate.